

NON-PUBLIC?: N
ACCESSION #: 9108050329
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Grand Gulf Nuclear Station PAGE: 1 OF 04

DOCKET NUMBER: 05000416

TITLE: Reactor Scram During ATT Surveillances
EVENT DATE: 04/06/91 LER #: 91-002-01 REPORT DATE: 07/31/91

OTHER FACILITIES INVOLVED: NA DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 074

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Riley Ruffin / Licensing Specialist TELEPHONE: (601) 437-2167

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

During a routine surveillance of the Main Turbine Mechanical Overspeed Trip Devices, an automatic reactor shutdown occurred. The test was being performed by the Automatic Turbine Tester (ATT) which uses a computerized test program. During the reset step of the computer program, a miniature circuit breaker in the ATT circuitry tripped open. This deenergized three solenoids which were needed to prevent a turbine trip due to testing. The cause of the premature breaker trip is attributed to the circuit breaker being undersized for its application. Due to aging and the breaker operating at loads which sometimes exceeded its rated current value, the breaker was operating in a degraded condition. The operating module which contained the miniature breaker was replaced and the test was successfully completed.

Following a review of the test circuitry design, a breaker with a higher current rating was placed in the test circuit. The circuitry was tested satisfactorily and used to perform the mechanical overspeed test. The

installed breaker will remain in service pending further design review. All safety systems functioned as designed. The reactor water remained at least 164 inches above the top of active fuel.

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END OF ABSTRACT

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A. Reportable Occurrence

During a routine surveillance of the Main Turbine Mechanical Overspeed Trip Devices, an actuation of the Reactor Protection System (RPS; EHS Code: JC) occurred. The actuation was due to a Turbine Stop and Control Valve Closure. This occurrence is reported pursuant to 10CFR50.73(a)(2)(iv).

B. Initial Condition

The plant was in Operational Condition 1 at approximately 74% reactor power. A biweekly surveillance to demonstrate the operability of the Main Turbine Mechanical Overspeed Trip Devices was in progress at the time of occurrence.

C. Description of Occurrence

On April 6, 1991, a biweekly surveillance of the Turbine Mechanical Overspeed Trip Devices was in progress using the Automatic Turbine Tester (ATT).

The ATT uses a computerized test program to perform the overspeed test. The devices being tested were two mechanical overspeed bolts located in the turbine shaft. During the test, test fluid, which is supplied by the overspeed trip test device (OTD), is used to force these bolts to their extended (trip) positions. To prevent a turbine trip, due to testing, the ATT energizes a solenoid valve (1N32F512) which controls the Turbine Control System's (EHC; EHS Code: TG) change-over valve. The change-over valve allows sufficient control fluid pressure to the EHC's trip fluid header to prevent a turbine stop/control valve closure. Control fluid is supplied to the change-over valve through two solenoid valves (1N32F511A & B) which are also energized by the ATT. The electrical trip signals are routed to the two supply solenoids to provide turbine protection during the test.

On April 6, 1991 at approximately 0427 an operating module breaker within the ATT circuitry tripped open, during Step 51 of the test program, deenergizing the control solenoid for the change-over valve and its associated supply valves. This caused a main turbine trip which resulted in an automatic reactor shutdown.

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The turbine trip also caused the Reactor Recirculation Pumps (EHS Code: AD) to shift from their normal power supply to the low frequency motor generators. The decrease in forced core flow caused a level increase in the vessel downcomer region which resulted in a decrease in feedwater system (FWS; EHS Code: SJ) flow. As a result of the FWS flow decrease, vessel water level decreased to approximately -2 inches as indicated by General Electric Transient Analysis Recording System (GETARS). Sensing the decrease in vessel water level, the FWS increased its flow rate to compensate for the decrease in vessel water level. The FWS restored the vessel water level to approximately 35 inches as indicated by GETARS. Due to the closure of the main turbine stop and control valves, reactor steam dome pressure peaked at 1054 psig. The main bypass/stop valves opened to decrease pressure and maintained vessel pressure at approximately 955 psig.

D. Apparent Cause

A subsequent investigation of the occurrence determined that a miniature circuit breaker (b4) in an ATT operating module (K21A) tripped open during the test. The breaker supplied power to the change-over valve's control solenoid and its two supply valves, which were essential to maintain the turbine online during the test.

During Step 16 of the ATT test program, the program verifies the mechanical bolts extend to their trip position prior to the test fluid header pressure reaching 21 psig, which is the computed upper limit for acceptance for the ATT Test. In the event both bolts do not trip prior to the test fluid header reaching 21 psig, the ATT drives the OTD to its end position to ensure the bolts are fully exercised during the test. It takes approximately 90 seconds to drive the OTD to its end position.

Following Step 16, Step 51, which is the first step of the reset portion of the test program, would verify that the OTD was in its

normal operating position. Therefore, the program would remain in Step 51 until the OTD was driven from its end position to its normal operating position. During Step 51, the current load exceeded the breaker's rated current value (3 amps). The duration of the breaker having to maintain the excess current was approximately 90 seconds. Subsequent calculations indicated that the current imposed on breaker b4 during step 51 was approximately 3.8 amps.

During the testing of the b4 breaker, it repeatedly tripped at approximately 90 seconds. During the investigation, test data for the b4 breaker was compared to new breakers and a current vs time-to-trip curve. Based on this comparison, it was concluded that the breaker should have maintained the load, imposed during Step 51, for a longer period of time (approximately 40 mins.).

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The K21A module was replaced with a new module and the ATT overspeed test program was completed satisfactorily with the turbine at 1800 rpm.

The cause of the breaker tripping prematurely is attributed to an inadequate design in the ATT circuitry. The b4 breaker is undersized for the load imposed during step 51 of the test program.

There are two major contributing factors to the occurrence.

- o The b4 breaker had degraded due to its age and its operating at current values greater than its rated value.
- o The overspeed bolts not extending to their trip positions prior to the test fluid pressure exceeding the pressure setpoint caused the amount of time the program would remain in step 51 to increase due to the OTD being at its end position.

E. Supplemental Corrective Actions

Prior to alterations to the ATT test circuitry, the mechanical overspeed test was successfully run from the turbine hydraulic rack.

Following an evaluation of the test circuitry design, a breaker with a higher current rating was installed in the test circuit. The circuitry was tested satisfactorily and is currently being used to perform the mechanical overspeed test.

The installed breaker will remain inservice pending further design review.

F. Safety Assessment

The Post Trip Analysis confirmed that the safety systems functioned as designed. The reactor level remained at least 164 inches above the top of active fuel during the event. The turbine/generator trip functions were in place at all times.

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July 31, 1991

U. S. Nuclear Regulatory Commission
Mail Station P1-137
Washington, D.C. 20555

Attention: Document Control Desk

Subject: Grand Gulf Nuclear Station
Unit 1
Docket No. 50-416
License No. NPF-29
Update To Reactor Scram During ATT Surveillance
LER 91-002-01

GNRO-91/00130

Gentlemen:

Attached is Licensee Event Report (LER) 91-002-01 which is a final report.

Yours truly,

WTC/RR/cg

attachment: LER 91-002-01

cc: Mr. D. C. Hintz (w/a)

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